

*A/*  
*and*  
sequentially forming red, green, and blue color filters by coating and patterning a red colored photoresist, a green colored photoresist, and a blue colored photoresist; and patterning the red, green and blue color filters to form the grooves.

### REMARKS

In response to the Office Action dated March 15, 2002, claims 1-30 have been amended. Claims 1-30 are active in this application. Based on the above Amendments and the following Remarks, Applicants respectfully request that the Examiner reconsider the outstanding rejections and they be withdrawn.

#### ***Rejections Under 35 U.S.C. §102***

In the Office Action, claims 1-5 and 24-26 have been rejected under 35 U.S.C. §102(b) for being anticipated by U. S. Patent No. 5,790,219 issued to Yamagishi, et al. ("Yamagishi"). This rejection is respectfully traversed.

In this response, independent claims 1 and 24 have been amended to clarify the claimed features of the present invention. Amended claim 1 recites "A panel for a liquid crystal display, comprising: a substrate; a plurality of pixel regions formed in the panel; color filters having grooves and formed on the substrate, *each groove formed within a corresponding one of the plurality of pixel regions*; and a common electrode formed on the color filters". In this regard, the Examiner asserted that Yamagishi teaches color filters having grooves. This assertion is respectfully disagreed with.

According to Yamagishi, the portions in Fig. 4 that are viewed by the Examiner as grooves are in fact boundaries of the color filters, not the grooves. Fig. 3 of Yamagishi clearly

shows that these portions are merely the boundaries of the color filters and no groove is formed within any of the pixels. Thus, Applicants respectfully submit that Yamagishi fails to teach or suggest the claimed feature of “each groove formed within a corresponding one of the plurality of pixel regions”.

Amended independent claim 24 also recites “A liquid crystal display, comprising: … a pixel electrode formed on the first substrate; a plurality of pixel regions, *each pixel region being defined as a region overlapping a corresponding one of the plurality of pixel electrodes; ... wherein the common electrode having a plurality of grooved portions, each grooved portion is formed within a corresponding one of the plurality of pixel regions*”. As previously mentioned, these claimed features are neither taught nor suggested by Yamagishi.

Thus, Applicants respectfully submit that claims 1 and 24 are patentable over Yamagishi. Likewise, dependent claims 2-5, 25 and 26, that are dependent from claims 1 and 24, would be patentable at least for the same reason. Accordingly, Applicants respectfully request that all the rejections and objections over claims 1-5 and 24-26 be withdrawn.

### ***Rejections Under 35 U.S.C. §103***

In the Office Action, claims 6-10 have been rejected under 35 U.S.C. §103(a) for being unpatentable over Yamagishi in view of U. S. Patent No. 5,309,264 issued to Lien, *et al.* (“Lien”). This rejection is respectfully traversed.

In this response, claim 6 has been amended and recites “A liquid crystal display, comprising: *a plurality of pixel regions* formed in the liquid crystal display; … a second substrate … including color filters having grooves …, wherein *each groove is formed within a*

*corresponding one of the plurality of pixel regions".* As previously mentioned, Yamagishi fails to teach or suggest this claimed feature.

Lien fails to cure this deficiency from the teaching of Yamagishi. Lien is directed to electrode patterns of multi-domain homeotropic cell liquid crystal displays, particularly to a portion of a common electrode which forms the top pixel electrode 62 having an X-shaped cutout 64, as shown in Fig. 2. However, Lien fails to teach or even remotely suggest the claimed feature of "each groove is formed within a corresponding one of the plurality of pixel regions" as recited in claim 6.

Thus, it is respectfully submitted that claim 6 and its dependent claims 7-10 are patentable over Yamagishi and Lien. Accordingly, Applicants respectfully request all the outstanding rejections and objections over claims 6-10 be withdrawn and pass those claims to issuance.

In the Office Action, claims 11-23 have been rejected under 35 U.S.C. §103(a) over Yamagishi in view of Lien, and further in view of U. S. Patent No. 5,608,556 issued to Koma ("Koma"). This rejection is respectfully traversed.

Claims 11-23 are dependent from independent claim 6. As aforementioned, claim 6 has been amended and is now believed to be patentable over Yamagishi and Lien. Koma is directed to controlling the direction of orientation vectors of liquid crystal molecules to provide a wide viewing angle by forming an orientation control electrode in a common electrode. However, Koma fails to teach or even remotely suggest "each groove is formed within a corresponding one of the plurality of pixel regions" as recited in claim 6.

Thus, it is submitted that claims 11-23 are patentable over Yamagishi, Lien and Koma. Accordingly, Applicants respectfully request that all the outstanding rejections and objections over claims 11-23 be withdrawn.

In the Office Action, claims 27-30 have been rejected under 35 U.S.C. §103(a) for being unpatentable over Yamagishi. This rejection is respectfully traversed.

In this response, independent claim 27 has been amended to recite "A method of manufacturing a panel for a liquid crystal display, comprising the steps of: ... forming color filters having grooves on said substrate, *each groove is formed within a corresponding one of a plurality of pixel areas ...*". As previously mentioned, this feature is neither taught or suggested in Yamagishi. No secondary reference has been introduced to cure the deficiency from the teachings of Yamagishi. Likewise, claims 28-30 that are dependent from claim 27 are also patentable over Yamagishi and other references. Accordingly, Applicants respectfully request that all the outstanding rejections and objections over claims 27-30 be withdrawn.

#### ***Other Matters***

In this response, claims 1-5, 7-23, 25, 26 and 28-30 have been amended solely for correcting informalities therein.

#### **CONCLUSION**

All of the stated grounds of objection and rejection have been properly traversed, accommodated, or rendered moot. Applicants therefore respectfully request that the Examiner reconsider all presently outstanding objections and rejections and that they be withdrawn.

Applicants believe that a full and complete response has been made to the outstanding Office Action and, as such, claims 1-30 are in condition for allowance. If the Examiner believes, for any reason, that personal communication will expedite prosecution of this application, the Examiner is invited to telephone the undersigned at the number provided.

Prompt and favorable consideration of this Amendment is respectfully requested.

Respectfully submitted,



Hae-Chan Park  
Reg. No. 50,114

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McGuire Woods LLP  
1750 Tysons Boulevard  
Suite 1800  
McLean, VA 22102-4215  
Tel: 703-712-5000  
Fax: 703-712-5050  
HCP:WSC/mhd

## APPENDIX

The "marked-up" version of the amended claims is as follows:

1. (Amended) A panel for a liquid crystal display, comprising:  
a substrate;  
a plurality of pixel regions formed in the panel;  
color filters having grooves and formed on the substrate, each groove formed within a corresponding one of the plurality of pixel regions; and  
a common electrode formed on the color filters.
  
2. (Amended) [A] The panel for a liquid crystal display as recited in claim 1,  
wherein the depth of the grooves is smaller than the thickness of the color [filter] filters.
  
3. (Amended) [A] The panel for a liquid crystal display as recited in claim 1, further  
comprising a black matrix formed on the substrate.
  
4. (Amended) [A] The panel for a liquid crystal display as recited in claim 1,  
wherein the grooves based on the black matrix define the pixel area.
  
5. (Amended) [A] The panel for a liquid crystal display as recited in claim 1,  
wherein the black matrix has portions overlapping the grooves.
  
6. (Amended) A liquid crystal display, comprising:

a first substrate including pixel electrodes having apertures;  
a second substrate facing said first substrate and including color filters having grooves  
and a common electrode formed on the color filters; and  
a plurality of pixel regions formed in said first substrate,  
wherein [said second substrate faces said first substrate] each groove is formed within a  
corresponding one of the plurality of pixel regions.

7. (Amended) [A] The liquid crystal display as recited in claim 6, wherein the  
grooves of the color filters overlap the pixel electrodes.

8. (Amended) [A] The liquid crystal display as recited in claim 6, wherein the depth  
of the grooves is smaller than the thickness of the color filters.

9. (Amended) [A] The liquid crystal display as recited in claim 6, further comprising  
a black matrix formed on the second substrate.

10. (Amended) [A] The liquid crystal display as recited in claim 6, wherein the black  
matrix has portions overlapping the grooves.

11. (Amended) [A] The liquid crystal display as recited in claim 6, wherein the  
grooves and the apertures form closed domains when they are viewed from above.

12. (Amended) [A] The liquid crystal display as recited in claim 6, wherein the grooves and the apertures are symmetrically arranged relative to each other.

13. (Amended) [A] The liquid crystal display as recited in claim 6, wherein the apertures have a first portion extending in a first direction and a second portion extending in a second direction that is different from the first direction.

14. (Amended) [A] The liquid crystal display as recited in claim 13, wherein the first direction and the second direction are perpendicular to each other.

15. (Amended) [A] The liquid crystal display as recited in claim 6, further comprising a liquid crystal layer interposed between the first substrate and the second substrate and having liquid crystal molecules of which long axes are vertically aligned relative to the first and the second substrates in the absence of an electric field.

16. (Amended) [A] The liquid crystal display as recited in claim 15, wherein the liquid crystal molecules have negative dielectric anisotropy.

17. (Amended) [A] The liquid crystal display as recited in claim 16, wherein the liquid crystal molecules have chirality.

18. (Amended) [A] The liquid crystal display as recited in claim 15, further comprising a first and a second polarizing films respectively attached on the outer surfaces of the

first and the second substrates, wherein polarizing axes of the first and the second polarizing films are perpendicular to each other.

19. (Amended) [A] The liquid crystal display as recited in claim 15, wherein a plurality of minute domains are formed in a pixel area by the grooves and the apertures.

20. (Amended) [A] The liquid crystal display as recited in claim 19, wherein the minute domains' average direction of the long axes of liquid crystal molecules are directed toward two directions.

21. (Amended) [A] The liquid crystal display as recited in claim 19, wherein the minute domains' average direction of the long axes of liquid crystal molecules are directed toward four directions.

22. (Amended) [A] The liquid crystal display as recited in claim 20, wherein the average long axes make an angle of 40° to 50° with the polarizing directions of the first and the second polarizing films.

23. (Amended) [A] The liquid crystal display as recited in claim 21, wherein the average long axes make an angle of 40° to 50° to the polarizing directions of the first and the second polarizing films.

24. (Amended) A liquid crystal display, comprising:

a first substrate;

a pixel electrode formed on the first substrate;

a plurality of pixel regions, each pixel region being defined as a region overlapping a corresponding one of the plurality of pixel electrodes;

a second substrate facing with the first substrate; and

a common electrode formed on the second substrate,

wherein the common electrode having [rugged non-smooth] a plurality of grooved portions [facing the pixel electrodes], each grooved portion is formed within a corresponding one of the plurality of pixel regions.

25. (Amended) [A] The liquid crystal display recited in claim 24, further comprising color filters having a plurality of grooves and formed on the second substrate, [and]

wherein the [rugged non-smooth] plurality of grooved portions of the common electrode are formed due to the grooves of the color filters.

26. (Amended) [A] The liquid crystal display recited in claim 24, further comprising a black matrix formed on the second substrate, [and]

wherein portions of the black matrix overlap the [rugged non-smooth] plurality of grooved portions of the common electrode.

27. (Amended) A method of manufacturing a panel for a liquid crystal display, comprising the steps of:

forming a black matrix on a substrate;

forming color filters having grooves on the substrate, each groove is formed within a corresponding one of a plurality of pixel areas; and

forming a common electrode on the color filters.

28. (Amended) [A] The method of manufacturing a panel for a liquid crystal display recited in claim 27, wherein the common electrode is form by two depositions of ITO (indium thin oxide).

29. (Amended) [A] The method of manufacturing a panel for a liquid crystal display recited in claim 27, wherein the step of forming color filters having grooves comprises the substeps of:

coating and patterning a red colored photoresist to form red color filters having grooves located in a pixel area defined by the black matrix;

coating and patterning a green colored photoresist to form green color filters having grooves located in a pixel area; and

coating and patterning a blue colored photoresist to form blue color filters having grooves located in a pixel area.

30. (Amended) [A] The method of manufacturing a panel for a liquid crystal display recited in claim 27, wherein the step of forming the color filters comprises the substeps of:

sequentially forming red, green, and blue color filters by coating and patterning a red colored photoresist, a green colored photoresist, and a blue colored photoresist; and patterning the red, green and blue color filters to form the grooves.